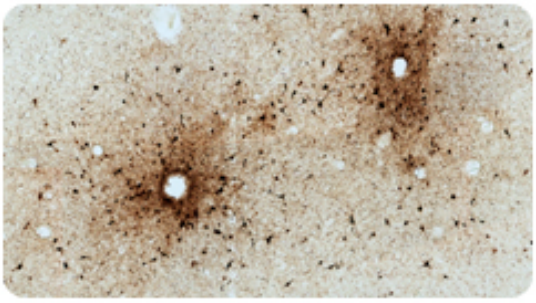
LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, May 14- 18, 2012

NEW RESEARCH ON BRAIN INJURIES



The brain of a 45-year-old male U.S. military veteran who was exposed to a single close-range improvised explosive device blast exposure two years before his death.

New research shows brain injuries from blasts are similar to the same impact that football players endure on the field.

In an advance that may someday provide health benefits for soldiers and athletes, a team of researchers has discovered a mechanism that could be the cause of traumatic brain injuries (TBI) in blast-exposed soldiers.

The breakthrough study, published this week in the journal *Science Translational Medicine*, finds that the brain injuries suffered by soldiers from improvised explosive devices (IEDs) are due to the head rotation or motion from the blast wind.

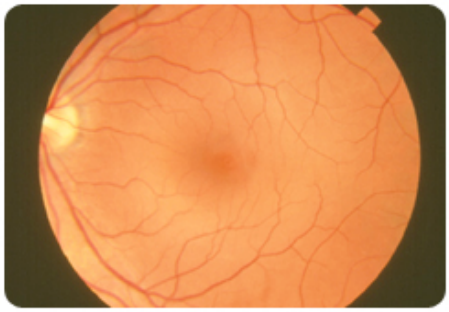
The researchers compared brain tissue samples from four soldiers with known blast exposure and/or concussive injury with brain tissue samples from three amateur American football players and a professional wrestler with histories of repetitive concussive injuries.

The results showed that the brain damage in blast-exposed veterans is similar to the brain injuries observed in football players who have sustained repetitive concussive head injuries. This result is a significant finding because it demonstrates a common link between what has previously been believed to be two disparate injury mechanisms.

To see more, go to ABC.

Popular Mechanics

LOOK INTO MY EYES



The back portion of the interior lining of the eyeball includes the retina, optic disc (the nerve that connects the eyeball to the brain), and the macula (the center of the retina).

A technique known as adaptive optics, which was originally developed to see distant stars, is now allowing researchers to diagnose eye diseases.

Diseases such as macular degeneration could be diagnosed months to years sooner than possible with other current methods.

Adaptive optics are used in astronomy to clear up distortions in the atmosphere caused by turbulence and wind shear so that stargazers can actually pinpoint new stars rather than just their twinkling.

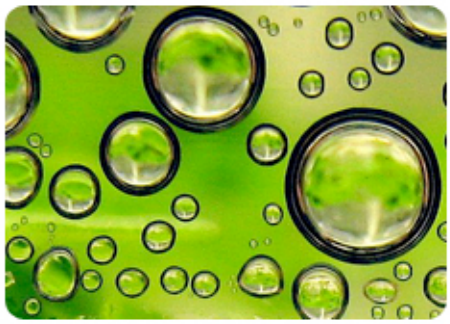
Human eyes also have their own "twinkling" problem. When ophthalmologists and vision scientists try to look deep into the eye, distortions within the cornea and lens impair light as it travels through the eyeball, frustrating their efforts.

A group of scientists, including Lawrence Livermore National Laboratory researchers, use adaptive optics to view minute details never before seen and to diagnose blinding disease like macular degeneration months to years before current methods allow.

To read more, go to *Popular Mechanics*.

UPI.com
OVER 100 YEARS OF JOURNALISTIC EXCELLENCE

FROM RAINFOREST TO THE FUEL TANK



By deciphering the makeup of a bacterium found in the soil of a tropical rain forest, scientists may have a better understanding of how to more efficiently produce biofuels.

The production of liquid fuels derived from plant biomass offers a promising technology for reducing greenhouse gas emissions and dependence on fossil fuels.

While sugars stored within the plant cell wall, known as lignocellulose, are plentiful enough to supply most energy needs on the planet, their extraction is difficult and requires chemical pretreatment followed by enzymatic digestion using micro-organisms. However, while ionic liquids -- salty solvents -- improve the digestibility of lignocellulose, they also are toxic to bacteria used in subsequent conversion steps.

Using new experimental methods and computational analysis, a team of scientists from the Joint BioEnergy Institute (JBEI), led by Lawrence Livermore's Michael Thelen, discovered how certain bacteria can tolerate manmade toxic chemicals used in making biofuels.

To read more, go to *UPI*.

INSIDESCIENCE
MAY 17, 2012

GETTING A MESSAGE FROM MERCURY

Morgan Burks

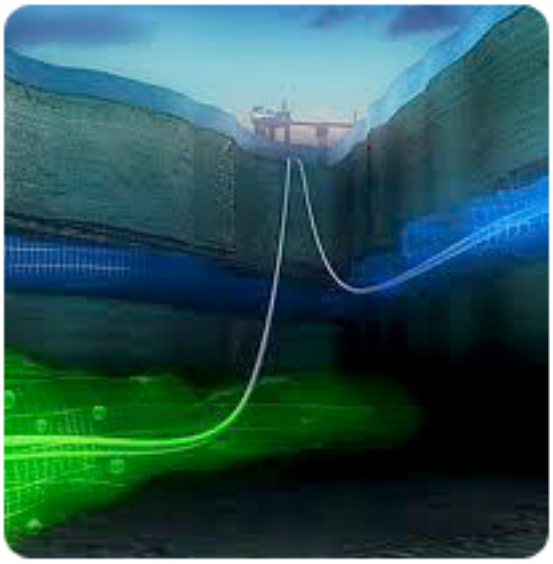
After seven years and almost 5 billion miles traveled, NASA's Messenger is the first spacecraft to orbit Mercury.

Part of the equipment on board is a gamma-ray spectrometer developed at the Laboratory that will be used to help determine the elemental and mineral composition of Mercury's radioactive surface.

"Surface composition allows scientists to figure out which formation theories of Mercury are correct," according to Morgan Burks, a Lab physicist who helped develop the spectrometer.

The Livermore team is now developing a handheld spectrometer that could be used to monitor border crossings and ports of entry for radioactive material.

To see more, go to the American Institute of Physics Website.



Carbon storage projects take the CO2 from a power plant's flue stream and store it underground.

Storing CO2 underground can induce small-scale seismic events. While operators aren't so concerned , the public is.

Over the last six months, several lower-magnitude earthquakes have occurred in the Midwest that have been attributed to the injection of wastewater into the subsurface from shale gas fracking operations.

Geologists point out that the subsurface injection of any type of fluid -- common in the CO2 storage, geothermal and oil and gas industries -- creates hundreds and thousands of earthquakes all the time, but most of those are too small to be felt at the surface. A multi-year study, conducted at the Laboratory as a part of the National Risk Assessment Partnership, has helped clarify that CO2 sequestration will not likely have a large seismic impact as long as site operators properly assess surrounding.

"In many cases, it won't be a major issue as long as [developers] plan their operations accordingly," said Bill Foxall, a seismologist at Lawrence Livermore who has conducted research on the topic. "But like anything else, you've got to do an adequate risk analysis to see what the significance of seismicity will be, and it's going to vary quite a bit from place to place. In most cases, it will dictate the long-term injection strategy at a project."

To read more go to GHG Reduction Technologies Monitor.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

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